

Figure 1:

Amino acid sequences of Cpn60 and Cpn10:

SEQ ID No 1: Cpn10 (encoded by nucleotides pos. 458-751 of Figure 2):

MKIRPLHDRIVVRRKEEETATAGGHIIPGAAAEKPNQGVVISVGTGRILDNGSVQALA
VNEGDVVVFGKYSGQNTIDIDGEELLILNESDIYGVLEA

SEQ ID No 2: Cpn60 (encoded by nucleotides pos. 800-2446 of Figure 2):

MAAKDVLFGDSARAKMLVGVNIIADAVRVTLGPKGRNVVIEKSFGAPIITKDGVS
AREIELKDKFENMGAQMVKEVASQANDQAGDGTATVLAQAIISEGLKSVAAGMN
PMDLKRIGDKATAAVVAAIKEQAQPCLDTKAIAQVGTISANADEVGRILAEAMEKV
GKEGVITVEEGKGLEDEL DVVEGMQFDRGYLSPYFINNQEKM TVEMENPLILLVDKK
IDNLQELLPILENVAKSGRPLLIVAEDVEGQALATLVVNNLRGTFKVA AVKAPGFGD
RRKAMLQDLAILTGQQVISEELGMSLETADPSSLGTASKVVIDKENTVIVDGAGTEAS
VNTRVDQIRAEIESSTSDYDIEKLQERVAKLAGGVAVIKVGAGSEMEMKEKKDRVD
DALHATRAAVEEGVVAGGGVALIRALSSVTVVGDNEDQNVGIALALRAMEAPIRQI
AGNAGAEGSVVVDKVKSGTGSFGFNASTGEYGDMIAMGILDPAKVTRSSLQAAASI
AGLMITTEAMVADAPVEEGAGGMPDMGGMGGMGGMGMPGMM

Figure 2:

SEQ ID No 3: DNA coding for Cpn60 and Cpn10:

Cpn10, pos. 458-751

Cpn60, pos. 800-2446

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cacaaccgaagccatgggtgcggatgcgcctgtgaagaaggcgtgggtgtatgcctgatafgggcggcatgggtggaatgggcg
gtatgcctggcatgatgtaatcactttgtgattcattgtcctgatctgcttaccgtgtaaaaagatcaggctcaaggctgtctctataaaaag
ccgtatctttgatgagtggtgtctttctgtgaaaacgacattctggagtgccgcttttttgattttggtcataaaatcagaatatgtgtaatt
ttatgtaactagctggcctataatgttgagttcctctgggtggcatgatctcatggtacttcacttaaggcctgattcactgcg
gctttaacagtaaaataataacgcaacgtagaaacataataagcgtatggcatfaatgaagacggctgcatttaattcagatc

Figure 3:

SEQ ID No 4: Amino acid sequence of esterase cloned from *Oleispira antarctica* (EstRB8):

EstRB8 (encoded by nucleotides 1145 to 2143 Frame 2 of Figure 4) 333 aa

MKNTLKSSSRFSLKQLGTGALHSSLFFGGCTTTQQDNLYTGVM SLARDSAGLEVKTA
SAGDVNLT YMERQGS DKDNAESVILLHGFSADKDNWILFTKEFDEKYHVIAVDLAG
HGDSEQLLT TDYGLIKQAERLDIFLSGLGVNSFHIAGNSMGG AISAIYSLSHPEKV KSL
TLIDAAGVDGDTESEYYKVLAEGKNPLIATDEASFEYRMGFTMTQPPFLPWPLRPSLL
RKTLARAEINN KIFSDMLKTKERLGMTNFQQKIEVKMAQHPLPTLIMWGKEDRVLD
VSAAA AFKKIIPQATVHIFPEVGH LPMVEIPSESAKVYEEFLSSIK

Figure 4:

SEQ ID No 5: DNA fragment from plasmid pBK1Est coding for esterase of *Oleispira antarctica* (EstRB8):

Nucleotide positions 1-100 correspond to reverse complement of positions 1196-1121 and 3799-3939 correspond to reverse complement of 1043-952 of pBK-CMV vector (Stratagene).

Positions 101-105 are *Bam*HI -- *Sau*3A1 fusion and positions 3795-3798 are *Sau*3A1-*Bam*HI-fusion.

acaggaaacagctatgaccttgattacgccaagctcgaaattaaccctcactaaaggaacaaaagctggagctcgcgcgcctgcag
gtcgacactagtggaalcaacggcggttcattggtactggctgagttcagcgtcataatgccgatgcgatactggccgtcagactgagtagt
tcttctgctagcaccgatttttctaafagcgcagcttcttatttctgaacgggcaactgattgtagtttttactaaccggcttttaggcaigg
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atactaattaataacaccttaattgagaagaataatgaaaaacacactcaaatctcatcagcttttagtctgaaacaactcggcaccggc
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ttccacccgggtgggtaccaggttaagtgtacccaattcggcctalagttagtctgtattacaattcactggccgtctgtttac

Figure 5:

Amino acid sequences expressed from vector pBK1CpnEst: - the co-expression of fragments encoding native chaperonins with the esterase gene (EstRB8), all from *Oleispira antarctica*

SEQ ID No 6: cpn10 (nucleotides 113 to 403; Frame 2 of Figure 6) 97 aa:

MKIRPLHDRIVRRKEETATAGGHLPGAAAEKPNQGVVISVGTGRILDNGSVQALA
VNEG DVVVF GKYS GQNTIDIDGEELLILNESDIYGVLEA

SEQ ID No 7: cpn60 (nucleotides 455 to 2098; Frame 2 of Figure 6) 548 aa:

MAAKDVLFGDSARAKMLVGVNLA DAVRVT LGPKGRNVVIEKSFGAPIITKDGVS
AREIELKDKFENMGAQM VKEVASQANDQAGD GTTTATVLAQAIHSEGLKSVAAGMN
PMDLKR GIDKATAAVVAAIKEQAQPCLDTKAIAQVGTISANA DETVGR LIAEAMEKV
GKEGVITVEEGKGLEDEL DVVEGMQFDRGYLSPYFINNQE KMTVEMENPLILLVDKK
IDNLQELLPILENVAKSGRPLLIVAEDVEGQALATLVVNNLRGTFKVA AVKAPGFGD
RRKAMLQDLAILTGGQVISEELGMSLETADPSSLG TASKVVIDKENTVIVDGAGTEAS
VNTRVDQIRAEIESSTSDYDIEKLQERVAKLAGGVAVIKVGAGSEMEMKEKKDRVD
DALHATRAAVEEGV VAGGGVALIRALSSVT VVGDNEDQNVGIALALRAMEAPIRQI
AGNAGAEGSVVVDKVKSGTGSFGFNASTGEYGD MIAMGILDPAKVTRSSLQAAASI
AGLMITTEAMVADAPVEEGAGGMPDMGGMGGMGGMGMPGMM

SEQ ID No 8: estRB8 (nucleotides 2579 to 3577; Frame 2 of Figure 6) 333 aa:

MKNTLKSSSRFSLKQLGTGALIHSSLFFGGCTTTQQDNLYTGVM SLARDSAGLEVKTA
SAGDVNLT YMERQGS DKN AESVILLHGFSADKDNWILFTKEFDEKYHVIAVDLAG
HGDSEQLLT TDYGLIKQAERLDIFLSGLGVNSFH IAGNSMGGAISAIYSLSHPEKVKSL
TLIDAAGVDGDTESEYYKVLAEGKNPLIATDEASFEYRMGFTMTQPPFLPWPLRPSLL
RKTLARAEINN KIFSDMLKTKERLGMTNFQQKIEVKMAQHPLPTLIMWGKEDRVL
VSAAAAFKKIIPQATVHIFPEVGHLP MVEIPSESAKVYEEFLSSIK

Figure 6:

SEQ ID No 9: pBK1CpnEst: - the fusion of native chaperonine-coding fragments with
esterase of *Oleispira antarctica* (EstRB8)

The DNA fragment coding for Cpn10 and Cpn60 is flanked by *SacI* site (pos. 69-75) and *SalI* site (encoded by pos. 2138-2143 of Figure 7):

Nucleotide positions 1-75 correspond to reverse complement of positions 1196-1121 and positions 5233-5273 correspond to reverse complement of 1043-952 of pBK-CMV vector (Stratagene)

Small letters – the Cpn10-Cpn60 encoding fragment,

Capital italics – fragments of vector pBK-CMV

Capital letters – fragment coding for EstRB8 from plasmid pBK1Est

ACAGGAAACAGCTATGACCTTGATTACGCCAAGCTCGAAATTAACCCCTCACTAAAGGGA
ACAAAAGCTGGAGCTCtaataacttgggatccaacagttggagagictagcaaatgaaaatccgtccattacatgatcgtatt
gttcttcgccgtaaagaagaagagaccgcaactgcgggtggtatttaccgggcgtgcggcagaaaaaccaatcaaggtgtgt
tatctctgtgggtacttggcgtattcttataatgggtcagtgcaagcgtggcggttaacgaaggcgtgtgtcttittgtaataactc
aggtcaaaatactatcgatcgtatgggaagaattatgatttgaatgaaagtatactacggcgtttagaagcttaattattacactca
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gtaaacatttttagcgcagcagtaagagttaccttaggacctaaaggctgtaacggtgtatagaaaaatcatttgggtgcaccgatcatcac
caaagatggtgttctgttgcgcgtgaaatcgaattgaaagacaaatcgaaaacatgggcgcacagatggttaagggaagtgtcttca
agccaacgaccaagccgggtgacggcacaacgacagcgaactgtactagcacaggcgattatcagcgaaggcttgaatctgttgcgg
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cggtaaaagaaggtgtgattaccgtgaagaaggcaaaaggcctgaagacgagcttgatgtgtagaaggcatgcagttcgaatgcgggtt
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gcaaggtgttatcgataaagaaaacaccgtgatgtgtatggcgaggtactgaagcaagcgttaatactcgtgttgaccagatccgtg
ctgaaatcgaaagctcgacttctgattacgacatcgaaaagtacaagaacgcgttgctaaagcttgcggcgccggttgcggtgattaag

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AATCGCAGTGGGTTTCTTGTTTTTCATCAACAGCAACAAACGTGAAATACCCCGTA
ATCGCATTTTTCTGATTATCAAAATACATACTTTCCACCAGCATATTAACTTCAAC
TTTTAAACTCGTCCGCCCTACCTCTATAACACTGGCAGTCAATTTCGACAATGGTAC
CTGCGGGAACAGGATGCTTAAAATCGATTTCGATCACTGCTGACGGTTACGATGCT
TTGTCGAGAAAAACGAGTCGCTGCAATAAAAGAAACCTCATCCATCCACTGCATT
GCAGTGCCACCGAATAACGTATCATGATGATTGTGTCTCTGGAAATACCGCTTT
AGAAATAGTGGTTTTTGATACGCGCTTTCGCTGCGCAATAATATCTTCTCTGCTAA
GAGTTGCGGATGGCATACTAACTCGCTTGATTAAAGATTAATAATAAATAGTTA
ACAGTATATTGAACTGAGGGTCTGAAGAACTCTAATACCTCTGAAGAACTTTGAG
GCCGCTAGAGAGAAAAAGACCAGTGATAATATTTTCATCTTGCCATGAGAGCTTATC
ATGAAAGCCTGTGCTTAAAATCAATCATTATATTTATTCATCTTTAATTGAAATAA
TACCAATATATTTTCATATATAATTTACACTACCTTATCTCACTAGACTTCCCGC
GCATAGGCGCAAACAATCAACGCAAGTTCACAATAAAGCGGTTTCGCTGCAACAC
ATGCCCTAGCGTCTAAAGTAGCACGCACAACACTGGCCAGTCGTACTAGCCCCCTT
TGCGATTTCGTGCAGACGAGCAACAAGCGCTATTAAACTTACCTAAATTTCTAACC
ACCACCATTGGTTCTTTTCCACAAACTCAAAAAACTCGTCAAATCCGCTTGCAATT
TAAACGCGATGACATAGATCTAATCGATTATCAAACCCGCATTCAAGCGCTCATT
AAAAACGCACCACTGGCAAGAAGTTCTACCTGCACTGACCAATATGCAAGCGGC
GGCGGAAGAGCTGCCTTTGATCGATCAAGAAGAAGGGAGCAGCAAAGAGGAAA
ACAATCAAAAAGAGGAGAGCAATCAAATAAAAACGAGTTATTGAGGATTTTAAT
TTTAAACAGGTATATTAATACCCTCTCTCGTAGTAAACAATGACTGTATTTACAC
AAAAATAAATAGAGGTATACCATGTCAAACATCTGGTTTGAAGTACCAAAGATTG
AAGTATTAAACCGTCAAATGGAAAATACTGCCTGCAGCAACTTAGGCATTCAAAT
TACAGAAATTGGCGATGATTATATCACTGGCACAATGCCAGCAGATGCACGTACC
TTCCAGCCAATGGGACTGATTCATGGCGGCTCAAATGTATTGCTGGCAGAAACAC
TGGGCAGCATGGCAGCTAACTGCTGTATTAATTTGTCTCAAGAATATIGTGTGG
CCAAGAAATTAACGCCAACCACATACGCGGTGTTCGTTCCGGCATAGTGACTGGC
ACAGCAACGCTAGTACACAAAGGAAGAACCCTCCAGATTTGGGAAATTCGCATC
GTTAACGATCCAAAGAATTCAAAAAGCTTCTCGAGAGTACTTCTAGAGCGGCCGCGGG
CCCATCGATTTTCCACCCGGGTGGGGTACCAGGTAAGTGTACCCAATTCGCCCTATAGT
GAGTCGTATTACAATTCCTGCGCGTCGTTTTAC

Figure 7:

Amino acid sequences expressed from vector pBK1CpnSREst: - the co-expression of the stabilized single ring mutant chaperonin with the esterase gene (EstRB8) from *Oleispira antarctica* (cpn10::stabilized single ring mutant Glu460Ala/Ser462Ala/Val463Ala::est)

SEQ ID No 10: cpn10 (nucleotides 113 to 403; Frame 2 of Figure 8) 97 aa:

MKIRPLHDRVVRRKEETATAGGIILPGAAAEKPNQGVVISVGTGRILDNGSVQALA
VNEG DVVVFGKYSGQNTIDIDGEELLILNESDIYGVLEA

Below – **Capital bold letters** are the mutations introduced

SEQ ID No 11: stabilized single ring mutant of cpn60 (nucleotides 455 to 2098; Frame 2 of Figure 8) 548 aa:

MAAKDVLFGDSARAKMLVGVN~~IL~~ADAVRVTLGPKGRNVVIEKSFGAPIITKDGVS
AREIELKDKFENMGAQM~~V~~KEVASQANDQAGDGT~~TT~~TATVLAQAIISEGLKSVAAGMN
PMDLKR~~G~~IDKATAAVVAAI~~KE~~QAQPCLDTKAIAQVGTISANADET~~V~~GR~~L~~IAEAMEKV
GKEGVITVEEGKGLEDEL~~D~~VVEGMQFDRGYLSPYFINNQE~~K~~MTVEMENPLILLVDKK
IDNLQELLPILENVAKSGRPLLIVAEDVEGQALATLVVNNLRGTFKVA~~AV~~KAPGFGD
RRKAMLQDLAILTGGQVISEELGMSLETADPSSLGTASKVVIDKENTVIVDGAGTEAS
VNTRVDQIRAEIESSTSDYDIEKLQERVAKLAGGVAVIKVGAGSEMEMKEKKDRVD
DALHATRAAVEEGVVAGGGVALIRALSSVT~~V~~VGDNEDQNVGIALALRAMEAPIRQI
AGNAGA~~AG~~~~AA~~~~AV~~VDKVKSGTGSFGFNASTGEYGDMIAMGILDPK~~V~~TRSSLQAAASI
AGLMITTEAMVADAPVEEGAGGMPDMGGMGGMGGMGMPGMM

SEQ ID No 12: EstRB8 (nucleotides 2579 to 3577; Frame 2 of Figure 8) 333 aa:

MKNTLKSSSRFS~~L~~KQLGTGALIISS~~L~~FFGGCTTTQQDNLYTGVM~~S~~LARDSAGLEVKTA
SAGDVNLTYMERQGS~~D~~KDNAESVILLHGFSADKDNWILFTKEFDEKYHVIAVDLAG
HGDSEQLLT~~T~~DYGLIKQAERLDIFLSGLGVNSFH~~I~~AGNSMGG~~A~~ISAIYSLSHPEKVKSL
TLIDAAGVDGDTESEYYK~~V~~LAEGKNPLIATDEASFEYRMGFTMTQPPFLPWPLRPSLL

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RKTLARAEINNKFSDMLKTKERLGMTNFQQKIEVKMAQHPLPTLIMWGKEDRVLD
VSAAAAFKKIIPQATVHIFPEVGHLPMVEIPSESAKVYEEFLSSIK

Figure 8:

SEQ ID No 13: DNA sequence of vector pBK1CpnSREst: the expression cassette for the co-expression of the stabilized single ring mutant chaperonin with the esterase gene (EstRB8) from *Oleispira antarctica* (cpn10::stabilized single ring mutant Glu460Ala/Ser462Ala/Val463Ala::est)

Nucleotide positions 1-75 correspond to reverse complement of positions 1196-1121 and positions 5233-5273 correspond to reverse complement of 1043-952 of pBK-CMV vector (Stratagene)

DNA fragment coding for Cpn10 and Cpn60 is flanked by *SacI* site (pos. 69-75) and *Sall* site (pos. 2138-2143).

In the DNA sequence:

Small letters --- the Cpn10-Cpn60 coding fragment,

Capital italics -- fragments of vector

Capital letters -- fragment coding for EstRB8 from plasmid pBK1Est

Capital bold letters = introduced mutations

ACAGGAAACAGCTATGACCTTGATTACGCCAAGCTCGAAATTAACCTCACTAAAGGGA
ACAAAAGCTGGAGCTCtaatacttgggatccaacagttggagagctagcaaatgaaaatccgtccattacatgatcgtatt
gttggtccgtaaaagaagaagagaccgcaactgcgggtggtattatttaccggcgctgcggcagaaaaaccaaataagggtgtgt
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AACTGACGCCAATTAATATAAGACATACTAATTAATAACTCCCTTAATTGAGAAG
AATAATGAAAAACACACTCAAATCCTCATCACGTTTTAGTCTGAAACAACCTCGGC
ACCGGCGCTCTGATTATCTCCAGTTTGTCTTCGGTGGTTGCACCACAACACAACA
AGATAATTTATACACAGGGGTATGTCTCTTGCGAGAGACAGCGCTGGCCTAGAA
GTTAAACAGCCTCTGCCGGTGACGTCAATCTTACTTATATGGAACGCCAAGGCA
GTGACAAAGATAATGCCGAAAGCGTTATTTTATTACACGGTTTCTCTGCTGATAA
AGATAACTGGATTCTTTTTACCAAAGAATTCGATGAAAAATATCATGTTATCGCT
GTCGATTTAGCGGGACATGGCGATTGAGAACAATTATTAACGACTGATTACGGTC
TCATAAAACAAGCCGAGCGTTTAGATATCTTCTTATCTGGCTTAGGGGTAACTC
ATTTACATCGCCGGTAATTCAATGGGGGGGGCTATCAGCGCAATCTACAGTTTG
AGTCACCCAGAGAAAGTTAAAAGTCTTACATTGATCGATGCAGCAGGTGTCGATG
GCGATACTGAAAGCGAATACTACAAAGTTTTGGCAGAAGGTAAGAATCCTTTAAT
TGCAACTGATGAAGCAAGTTTTGAATACCGCATGGGTTTCACCATGACTCAGCCT
CCTTTCCTACCTTGGCCACTAAGACCTTCTTTATTACGTAAAACGCTAGCCCGTGC
CGAGATCAATAACAAAATTTTTTCCGATATGCTGAAAACCAAAGAACGTTTAGGA
ATGACTAACTTTCAACAGAAAATTGAAGTGAAAATGGCTCAACATCCATTGCCAA
CACTGATTATGTGGGGCAAAGAAGATCGCGTTCTTGACGTATCCGCAGCAGCGGC

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CTTCAAAAAATAATTCCACAAGCAACTGTTTCATATTTTTCTGAAGTAGGCCAC
CTACCTATGGTAGAAATTCCTAGTGAAAGCGCTAAAGTTTATGAAGAGTTTTTGT
CCTCTATTAAATAAGAGCACATAATCATGACTGACTTATAAACAGCCAAGCATTT
AAAATGCTTGGCTGTTTATTTTAATGGCCAAATTATTCAACGACCAAGCTCTGCG
GTAAAATCGCAGTGGGTTTCTTGTTTTTCATCAACAGCAACAAACGTGAAATACCC
CGTAATCGCATTTTTCTGATTATCAAAATACATACTTTCCACCAGCATATTAACCT
CAACTTTTAACTCGTCCGCCCTACCTCTATAACACTGGCAGTCAATTCGACAATG
GTACCTGCGGGAACAGGATGCTTAAATCGATTTCGATCACTGCTGACGGTTACGA
TGCTTTGTGCGAGAAAAACGAGTCGCTGCAATAAAAGAAACCTCATCCATCCACTG
CATTGCAGTGCCACCGAATAACGTATCATGATGATTTGTTGTCTCTGGAAATACC
GCTTTAGAAATAGTGGTTTTTGATACGCGCTTTCGCTGCGCAATAATATCTTCTCT
GCTAAGAGTTGCGGATGGCATAACATAAACTCGCTTGATTAAAGATTAAATAAAT
AGTTAACAGTATATTGAACTGAGGGTCTGAAGAACTCTAATACCTCTGAAGAACT
TTGAGGCCGCTAGAGAGAAAAAGACCAGTGATAATTTTCATCTTGCCATGAGAGC
TTATCATGAAAGCCTGTGCTTAAATCAATCATTATATTATTTCATCTTTAATTGA
AATAATACCAATATATTTTCATATATAATTTACACTACCCTTATCTCACTAGACTT
CCCGCGCATAGGCGCAAACAATCAACGCAAGTTCACAATAAAGCGGTTGCTGCG
AACACATGCCCTAGCGTCTAAAGTAGCACGCACAACACTGGCCAGTCGTA TAGC
CCCTTTGCGATTTCGTGCAGACGAGCAACAAGCGCTATTAAACTTACCTAAATTC
TAACCACCACCATTGGTTCTTTTCCACAAACTCAAAAAACTCGTCAAATCCGCTTG
CAATTTAAACGCGATGACATAGATCTAATCGATTATCAAACCCGCATTCAAGCGC
TCATTTAAAAACGCACCACTGGCAAGAAGTTCTACCTGCACTGACCAATATGCAAG
CGCGGCGGAAGAGCTGCCTTTGATCGATCAAGAAGAAGGGAGCAGCAAAGAGG
AAAACAATCAAAAAGAGGAGAGCAATCAAATAAAAACGAGTTATTGAGGATTTT
AATTTTAAAACAGGTATATTAATACCCTCTCTCGTAGTAAACAATGACTGTATTTA
CACAAAAATAAATAGAGGTATACCATGTCAAACATCTGGTTTGAAGTACCAAAG
ATTGAAGTATTAAACCGTCAAATGGAAAATACTGCCTGCAGCAACTTAGGCATTC
AAATTACAGAAATTGGCGATGATTATATCACTGGCACAATGCCAGCAGATGCACG
TACCTTCCAGCCAATGGGACTGATTCATGGCGGCTCAAATGTATTGCTGGCAGAA
ACACTGGGCAGCATGGCAGCTAACTGCTGTATTAATTTGTCTCAAGAATATTGTG
TTGGCCAAGAAATTAACGCCAACCACATACGCGGTGTTTCGTTCCGGCATAGTGAC
TGGCACAGCAACGCTAGTACACAAAGGAAGAACCTCCCAGATTTGGGAAATTCCG
CATCGTTAACGATCCAAAGAATTCAAAAAGCTTCTCGAGAGTACTTCTAGAGCGGCCG

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CGGGCCCATCGATTTCCACCCGGGTGGGGTACCAGGTAAGTGTACCCAATTCGCCCT
ATAGTGAGTCGTATTACAATTCCTGGCCGTCGTTTTAC

Figure 9:

Amino acid sequence of the stabilized single ring mutant Glu460Ala/Ser462Ala/Val463Ala of Cpn60:

SEQ ID No 14: Cpn10 (nucleotides 458-751 of Figure 10):

MKIRPLHDRVVRRKEEETATAGGHILPGAAAEKPNQGVVISVGTGRILDNGSVQALA
VNEGDVVVFGKYSGQNTIDIDGEELLILNESDIYGVLEA

SEQ ID No 15: Cpn60 (nucleotides 458-751 of Figure 10):

MAAKDVLFGDSARAKMLVGVNILADAVRVTLGPKGRNVVIEKSFGAPIITKDGVSV
AREIELKDKFENMGAQMVKEVASQANDQAGDGTTTATVLAQAIHSEGLKSVAAGMN
PMDLKRKIDKATAAVVAAIKEQAQPCLDTKAIAQVGTISANADET VGRLIAEAMEKV
GKEGVITVEEGKGLEDEL DVVEGMQFDRGYLSPYFINNQEKM TVEMENPLILLVDKK
IDNLQELLPILENVAKSGRPLLIVAEDVEGQALATLVVNNLRGTFKVA AVKAPGFGD
RRKAMLQDLAILTGGQVISEELGMSLETADPSSLGTASKVVIDKENTVIVDGAGTEAS
VNTRVDQIRAEIESSTSDYDIEKLQERVAKLAGGVAVIKVGAGSEMEMKEKKDRVD
DALHATRAAVEEGVVAGGGVALIRALSSVT VVGDNEDQNVGIALALRAMEAPIRQI
AGNAGAAGAAVVVDKVKSGTGSFGFNASTGEYGDMIAMGILDPK VTRSSLQAAASI
AGLMITTEAMVADAPVEEGAGGMPDMGGMGGMGGMGMPGMM

Figure 10:

SEQ ID No 16: DNA sequence of the stabilized single ring mutant

Glu460Ala/Ser462Ala/Val463Ala:

In the DNA sequence:

Small letters – the Cpn10-Cpn60 coding fragment,

Big bold letters = introduced mutations

atcaaaaaatgcagcaaggacagattcctgccccagaatfagcagaagggttcttgttagcactggccggcgcttaltatfaacgccgg
gtttgtcactgatgcgctgggtttacattactegtecccgacgcgtaaaagcggtggtccataagggtgattgcattattaccctc
gcatgatgactgcaagcagcttcaagcgacgggtagtttcaggaaggctcgttfaaagatgtacattcgacacigactcgaaagca
gtcatgaaaaaatcacaattgaaggcgaatataccaaagacgataagtaggtatttttggctagccggtgaaatcctagtaaaagccc
cgataaaitaaccatctattttcacagaggcaatttagcccttgtttacattatgafectaatactgggafccaacagttggagagctfagc
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aagtgatactacggcggtttagaagcttaattattacactcacctttttatfaacctacaaaaittaaggaaagatcatggtgctaaagacg
tattatttgggtgatagcgacgcgcaaaaatgttggfagggtgtaaacattttagccgacgcagtaagagttaccttaggacctaa
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aatcgaaaacatgggcgcacagatggttaagggaagtgtcttcaagccaacgaccaagccgggtgacggcacaacgacagcgact
gtactagcacaggcgattatcagcgaaggcttgaatctgttgcggctggcatgaafccaatggatcttaaacgtgggtattgataaagcta
cggctgctgttgttgcgcccaataagaacaagctcagccttcttggatacaaaagcaatcgctcaggtaggggacaatctctgccaatg
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ctagggatgtcttagaaaactcgggactcttcttgggtacggcaagcaagggtgttatcgataaagaaaaacaccgtgattgttga
tggcgcagggtactgaagcaagcgtaataactgtgttaccagatccgtgtgaaatcgaaagctcgacttctgattacgacatcgaaaa
gttacaagaacgggttctgaagcttgcggggcggttgcgtgaltaaagggttgggtcgggttctgaaatggaaatgaaagagaagaaa
gaccgtgttgacgatgcacttcatgcaactcgcgcagcggtgaagaagggtgttgttgcgggtgggtgttcttctgattcgcgcactct
cttcagtaaccgttgttggatgaacgaagatcaaacgtcggtattgcatlggcacttctgtcgatggaagctctatcgcgtaaaatgcg

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gatcacaaccgaagccatgggtgcggatgcgcctgtgaagaaggcgctgggtgatgcctgatatggcgggcatgggtggaatggg
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agccgtatctttgatgagtgtgtctttctgtgaaaacgacattcttggagtgccgcttttttgattttggtcataaaattcagaatattgtga
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gctttaacagtaaaataataacgcaacgtagaaacataataagcggtatggcattaatgaagacggcctgcatttaattcagatc